

REMARKS

Paragraph [0076] of the specification is amended to correct a grammatical error.

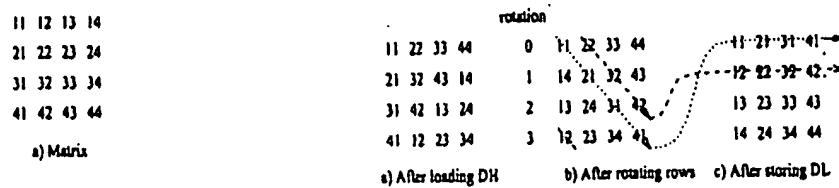
In paragraph 1 of the Office action, claims 1–36 are rejected under 35 U.S.C. § 102(b) as being anticipated by Hanounik et al., “Linear-Time Transpose Algorithm Using Vector Register File With Diagonal Registers” (Hanounik). The copy of the article provided to the undersigned is undated, but the subject matter appears similar to that of U.S. Patent Publication Number 2003/0084081 published May 1, 2003, and filed on October 27, 2001. Applicant will address this rejection on the merits, without admitting that the article is prior art.

The examiner cites Figure 4 as illustrating the claimed method. An original matrix is shown in Figure 4a and a transposed matrix is shown in Figure 4b, but the examiner has failed to recognize that the actual movement of data is not shown by the arrows in Figure 4b, but rather is shown in Figure 4c and explained in detail in conjunction with Figure 5.

The method of Hanounik is summarized in the following three stages (see bottom of page 4 and top of page 5):

1. Load row_i from memory into DH_i register, $i = 0, \dots, n - 1$
2. Rotate R_i register to the right by i positions, $i = 1, \dots, n - 1$
3. Store DL_i register back in memory rows 0 to $n - 1$,
 $i = 0, n - 1, n - 2, \dots, 1$

The method of Hanounik is explained in conjunction with Figures 5a, 5b, and 5c, which are reproduced below along with the original matrix from Figure 4a.



The first step of the Hanounik method is illustrated in Fig. 5a. Comparing Fig. 5a to Fig. 4a, it is seen that the first column is the same. The second column, however, has been

rotated south to north by one position such that the 12 wraps around from the top of the matrix to the bottom, and each number moves up one position. For the third column, both the 13 and the 23 have rotated off the top of the matrix and reappeared at the bottom of the matrix such that each value in column three is moved up two positions. For the fourth column, the 14, 24, and 34 have rotated off the top of the matrix and appeared on the bottom of the matrix such that each value in column four has moved up three positions.

The second step of the Hanounik method, rotating the rows, is illustrated in Fig. 5b. It is seen by comparing Fig. 5b with Fig. 5a that the first row has not been rotated, the second row has been rotated to the right by one position, the third row has been rotated to the right by two positions, and the fourth row has been rotated to the right by three positions.

The third step in the Hanounik method is to store the DL_i register back into the memory rows. Note that the DL registers of step 3 are not the same as the DH registers of step 1. The DL registers extend from the top left corner to the bottom right corner and represent the main diagonal as shown in Fig. 2 on page 3. The DH registers extend from the bottom left corner to the top right corner, as shown on page 3.

The third and last step of the Hanounik method is shown in Fig. 5c. By comparing Fig. 5c with Fig. 5b, it is seen that the diagonals of the matrix are now presented as rows.

It is respectfully submitted that when the actual method disclosed in Hanounik is properly viewed, it is significantly different than the subject matter of the independent claims.

Turning first to independent claim 1, that claim recites a plurality of shifting operations and a plurality of storing operations. The shifting and storing operations are coordinated to enable data to be “collected in a diagonal of processing elements.” The collection of data is along a first direction, e.g., a row or a column. After the data has been collected, it is then output from “said processing elements located in said diagonal” in at least one second direction perpendicular to the first direction, e.g., a column or row. The plurality of storing operations that occurs in response to the data being output are responsive to the processing elements’ position. When thus viewed, it is seen that there is no correspondence between the steps of claim 1 and the method of Hanounik. There is no loading of rows into diagonal-up registers. There is no rotation of the rows, and there is no storing back into the memory from the diagonal-down

registers. It is applicant's position that amended claim 1, along with dependent claims 2-7, are in condition for allowance.

Claim 8 is another independent claim which recites a first plurality of shifting and storing operations coordinated to enable data to be collected from along a first direction (e.g., east to west along the rows) and stored along a second direction perpendicular to the first direction (e.g., north to south along the columns). The claim goes on to recite a second plurality of shifting and storing operations to enable data to be collected from along a third direction opposite to the first direction (e.g., west to east along the rows) and stored along a fourth direction opposite to said second direction (e.g., south to north along the columns). When the steps of claim 8 are compared to the method of Hanounik, it is seen that there is no correspondence. There is no loading of rows into diagonal-up registers, no rotation of rows, and no storing back into the memory from the diagonal-down registers. It is therefore applicant's position that independent method claim 8, along with its dependent claims 9-14, are in condition for allowance.

Claim 15 recites a number of shifting and storing steps which enables data to be collected along a diagonal of processing elements and then to be distributed from that diagonal in a direction perpendicular to the direction of collection. There is no correspondence between the method of claim 15 and the method of Hanounik. There is no loading of rows into diagonal-up registers, no rotation of rows, and no storing back into the memory from the diagonal-down registers. Accordingly, it is applicant's position that independent claim 15 and dependent claims 16-21, are in condition for allowance.

Claim 22 is similar to claim 1 in that it recites a plurality of shifting and storing operations coordinated to enable data to be collected from along a first direction (e.g., east to west along each row) and stored along a second direction perpendicular to the first direction (e.g., north to south along each column). There is no correspondence between the steps of claim 22 and the method of Hanounik. There is no loading of rows into diagonal-up registers, no rotation of rows, and no storing back into the memory from the diagonal-down registers. It is therefore applicant's position that independent claim 22, and its dependent claims 23-28, are in condition for allowance.

Claim 29 recites a first shifting of data in a first direction, a first storing of data along a diagonal of processing elements, a second shifting of data from the diagonal of processing elements in a second direction perpendicular to the first direction, and a second storing of data in the processing elements in response to the second shifting and in response to the processing elements' position. As with the other claims, there is no correspondence between the steps of claim 29 and the method of Hanounik. There is no loading of rows into diagonal-up registers, no rotation of rows, and no storing data back into the memory from diagonal-down registers. Accordingly, it is applicant's position that independent claim 29, and its dependent claims 30-35, are in condition for allowance.

Claim 36 is an apparatus claim which corresponds to method claim 1. For the same reasons that method claim 1 is believed to be in condition for allowance, apparatus claim 36 is also believed to be in condition for allowance.

It is the examiner's position that claims 2-6, 9-13, 16-20, 23-27, and 30-34 "fail to be clearly recited as steps and the subject matter therein fails to be related to the previously recited steps and the sequence thereof." In response, each of claims 2, 9, 16, 23, and 30 has been amended. For example, in claim 2, the claim refers to the plurality of storing operations recited in claim 1 as being responsive to initial counts. Each of those initial counts is based on a processing element's position, and the initial counts are either loaded into at least certain of the processing elements or calculated locally. By introducing additional limitations which state that the storing operation is responsive to initial counts and that those counts are either loaded into or calculated locally, claim 2 further defines what is meant by the storing operations being responsive to a processing element's position. It is believed that amended claims 2, 9, 16, 23, and 30 overcome the 35 U.S.C. § 112 rejection. If the examiner remains of the opinion that those claims are still indefinite, the examiner is invited to suggest claim language to overcome the problem.

In claim 8, line 3, the phrase "a first direction" and "a second direction" are said to lack meaning because a reference is lacking. It is respectfully submitted that the first and second directions are, in fact, arbitrary. The only limitation of significance is the relationship between the first and second directions, i.e., the second direction must be perpendicular to the first

direction. However, the first direction could be north, south, east, west, up, or down. It is respectfully submitted that a person of ordinary skill in the art would understand the phrases "a first direction" and "a second direction" as those phrases are used in claim 8. Accordingly, no change has been made to claim 8.

Finally, claims 10, 17, 24, and 31 have been amended to correct an antecedent basis issue identified by the examiner.

Applicant has made a diligent effort to place the instant case in condition for allowance. Accordingly, a notice of allowance for claims 1-36 is respectfully requested. If the examiner is of the opinion that the instant application is in condition for disposition other than through allowance, the examiner is requested to contact applicant's attorney at the telephone number listed below.

Respectfully submitted,



Edward L. Pencoske
Reg. No. 29,688
Jones Day
One Mellon Center
500 Grant Street, 31st Floor
Pittsburgh, PA 15219
Telephone: (412) 394-9531
Fax: (412) 394-7959